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ARRANGEMENT FOR WIRING AN ELECTROCHEMICAL SENSOR

Background Information

Electrochemical solid electrolyte sensors, in particular for determining the oxygen content in exhaust gases of internal combustion engines, operate according to the so-called Nernst principle, according to which an electromotive force (EMF) is picked off, as the probe voltage, between a reference electrode having an excess of oxygen and a measurement electrode to which the measured gas is applied. The EMF occurs if an oxygen concentration $\lambda < 1$ is present in the measured gas, stoichiometric conditions being present in the measured gas when $\lambda = 1$. The probe voltage is conveyed to a control device as a measurement signal. Electrochemical solid electrolyte sensors require a temperature of at least 300°C in order to operate. An electrical resistance heater, operated with a heating voltage that corresponds (when the sensor is used in a motor vehicle) to the vehicle's battery voltage, is integrated into the solid electrolyte sensor for that purpose. The reference electrode of the solid electrolyte sensor is connected as the positive electrode. The measurement electrode is connected to ground (negative pole). When solid electrolyte sensors are operated, it is found that coupling of the heat voltage into the probe voltage occurs. This falsifies the measurement signal. It has already been proposed to separate the sensing element and the heater from one another, or to provide between the heater and the adjacent electrode a shielding electrode to dissipate the coupled-in voltage (see German Patent Application No. 31 20 159).

Summary Of The Invention

The arrangement according to the present invention has the advantage that coupling of the heater voltage can effectively be blocked with simple means.

Coupling is most effectively prevented if the electrode adjacent to the resistance heater lies in a layer plane of the solid electrolyte element, and has at least approximately the surface extent of the further electrode.

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Brief Description Of The Drawings

Figure 1 shows a cross section through a solid electrolyte sensor having a wiring layout as defined in the existing art.

Figure 2 shows a cross section through a first exemplary embodiment of a solid electrolyte sensor in accordance with the wiring layout according to the present invention.

Figure 3 shows a cross section through a second exemplary embodiment of an electrochemical solid electrolyte sensor.

Detailed Description

Figure 1 shows an electrochemical oxygen sensor with a schematic depiction of an electrical wiring layout. The sensor has a ceramic element 11 made of a ceramic that conducts oxygen ions (for example stabilized ZrO_2), a measurement electrode 12, and a reference electrode 13. Measurement electrode 12 is exposed to a measured gas. Reference electrode 13 is arranged in a reference duct 15 that communicates with a reference gas, e.g. air. An electrical resistance heating element 17 that is embedded in an electrical insulator 18 is integrated into ceramic element 11.

The electrical wiring layout of electrodes 12, 13, and resistance heater 17 is depicted schematically, resistance heater 17 being operated with a heating voltage U_H of, for example, 12 V. The negative terminal is connected to ground. Measurement electrode 12, constituting the negative electrode, is also connected to ground. Reference electrode 13 is operated as the positive electrode.

Figure 2 shows the same solid electrolyte sensor as in Figure 1, but with the electrical wiring layout according to the present invention, according to which reference electrode 13, constituting the positive electrode, is connected to ground. Measurement electrode 12 is wired as the negative electrode. According to the present invention, the electrode located closest to resistance heater 17 - which in the present case is reference

electrode 13 - is connected to ground. A negative probe voltage U_S is thereby created. The result is that a negative operating voltage U_B, which powers a circuit arrangement for analyzing the negative probe voltage U_S, is made available via a circuit that is known per se. The necessary circuit for generating a negative operating voltage U_B is known per se and available to one skilled in the art.

A further exemplary embodiment of an oxygen sensor is evident from Figure 3. What is arranged here is a reference electrode 20 that extends over the width of reference duct 15 and possesses, approximately in the layer plane, the surface extent of measurement electrode 12. The larger-area reference electrode 20 thus additionally acts as a shield against any coupling of heater voltage U_H into measurement electrode 12. The further elements of the exemplary embodiment in Figure 3 correspond to the exemplary embodiment in Figure 2.

The present invention is not limited to the exemplary embodiments of planar oxygen sensors described above. It is just as conceivable also to utilize the proposed electrical wiring layout in solid electrolyte sensors of so-called finger shape, i.e. having a solid electrolyte element that is constituted by a solid electrolyte tube that is closed on one side.

The wiring layout according to the present invention is moreover also usable in electrochemical pump cells in which oxygen is pumped by application of a pump voltage, and the limiting current which flows in that context is utilized as the measurement signal. The negative operating voltage U_B is used in this context as the pump voltage.